

HOW TO Service your engine in 12 simple steps

Ali Wood gets some expert advice from Stu and Laura Davies on *Maximus's* engine, fuel system and Volvo Penta saildrive



As Andrew Simpson says in the *RYA Diesel Engine Handbook*, 'A wise skipper will maintain their engine properly and know exactly where to turn if it develops problems'. Knowing how to diagnose and fix faults is a useful skill for any boat owner, but of course, prevention is even better.

Now that *Maximus's* hull was painted, topsides polished and seacocks replaced, our Maxi 84 was looking good. The mast was wired, leaks fixed and thru-hulls fitted. It was nearly time for launch... but the one job left was giving me sleepless nights.

For two years, the 43-year-old cruiser had been languishing in a Chichester boatyard and it was anyone's guess what shape the engine was in.

There was, however, a glimmer of hope. The day following the survey we'd asked Dell Quay Marine to jump-start the engine (the batteries having been flat when we viewed her). It started first time. Also, the previous owner, Daniel Kirtley, who kindly donated the boat, had been meticulous with servicing. Any faults with the engine

LEFT Laura checks the engine
BELOW Stu at work



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wouldn't be through neglect, but just time spent inactive during lockdown.

I called PBO's engine expert, Stu Davies, and asked him if he wanted to do the service. He didn't hesitate, and drove five hours from North Wales with his wife, Laura. By the time we'd finished, *Maximus's* Volvo Penta MD2020 engine was in tip top condition. I never realised engine servicing could be so much fun!

Stu and Laura

Stu used to work for oil companies in Africa and the Middle East. It was an interesting life, because if he couldn't fix the engines, then nobody could.

"I'm used to making things work in difficult circumstances," he said. Hopefully *Maximus* would be straightforward.

Laura and Stu work as a team. With her slim fingers, Laura's a whizz at getting into part of the engine no-one else can reach and, like Stu, has a way of explaining things that make perfect sense.

"I do like fiddling with engines," says Laura, "and I always think if anything happens when we're out at sea, it's good to know what to do to get home."

First impressions

An engine service should be done at around 100 hours, which is approximately a season's use.

Stu's first impression was that the 2005 engine was in pretty good nick. It was clean and the paint was in good condition.

"This is one of the bulletproof Perkins ones," he said. "It's simple, easy to work on and parts are readily available."

In fact, he'd brought all the servicing parts along, kindly donated by parts4engines.com.

There was surface rust on the engine mountings, which was no surprise given that the companionway hatch above it had been leaking. The rainwater had found its way to the top of the secondary filter, which was rusty, along with the starboard engine mount. However, Laura demonstrated how easily the rust could be removed with a wire brush, and Stu recommended painting it with rust curer and Hammerite.

1 Fuel tank inspection

Maximus's 10-gallon tank is a simple square design with an inspection hatch under the starboard aft seat. As Laura got to work undoing the fuel inlet, tank breather pipe and fuel lines, Stu gave me a handy tip. "Lefty loosey, righty tighty," he said, referring to the screw-type fuel shut-off valve. "Make sure that when you open the valve fully and get to the end, you close it half a turn so the next person that handles it will know whether it's open or closed and won't break it."

This would later turn out to be useful advice when, on the shakedown cruise, the valve vibrated closed, cutting off the fuel supply!

The lid was held on by 6mm bolts, with

the thread tapped into the tank. A flexible gasket sealed it to the tank which Stu and Laura were careful not to damage.

It all came apart easily enough, and Stu demonstrated how the fuel gauge worked via a float that goes up and down. He pointed out the pickup pipe – what's known as a stack pipe – which ensures fuel is taken from the bottom of the tank.

I remembered learning the same thing about the PBO pool car when I accidentally put petrol in the diesel tank and drove 30 miles. Fortunately, the stack pipe saved my bacon – it must have drawn the remaining diesel from the bottom of the tank and fortunately the garage was able to siphon out the petrol at the top before it did any damage.

The fuel system

Next, Stu explained how the fuel is fed from the tank to the engine and the excess fuel returned.

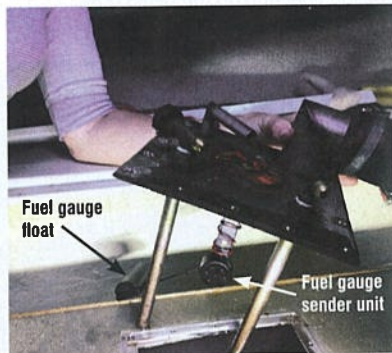
"A lot of people don't realise that the fuel filters are actually polishers," said Stu. "The fuel goes through the pump to the injectors and unused fuel goes back to the tank so is actually cleaned every time you use it."

Stu got out his torch ready to inspect the fuel. "Diesel bug grows on the interface between water and diesel," he said. "You can see sometimes where the condensation has trickled down the inlet pipe, gone into the tank and run to the lowest part."

Our surveyor, Ben Sutcliffe-Davies had



Undoing fuel lines ready to remove the inspection hatch of the fuel tank



Hatch cover removed, you can now see the feed pipes and fuel gauge

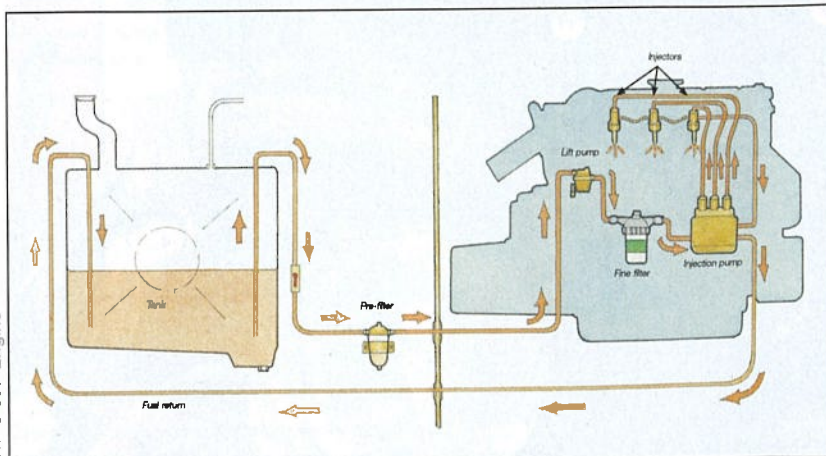
'An engine service should be done at around 100 hours – a season's use'

warned there might be diesel bug, so I held my breath, hoping there wouldn't be any evidence of it. Fortunately the stack pipe and return pipe to and from the engine were spotless – that was good news – but there were clear black marks on the side of the tank where the dreaded bug had been.

Stu concluded that this was the remnants of dead bug – or microbial contamination – but nothing to worry about now. He shone an LED torch through the fuel, which was red diesel, and appeared nice and clear.

"The diesel's been in the tank for two years and I can't see any water in there. That's the culmination of previous years. I don't think the bug's live, or that it will make any difference to what you're going to do," he said.

I asked Stu about filling the tank to the top, to prevent the opportunity for diesel bug to grow. While he said it was a good idea, he said he checks his tank every five years, and had never done it



How diesel fuel travels from the tank to the engine and back

himself nor had any problems.
Fuel verdict: The fuel is clean. Dose it heavily with Marine 16 to prevent diesel bug growth and at some point in the future remove the tank and steam clean the inside of it.

2 Primary fuel filter change

To my surprise the next thing Stu pulled out of his bag of tricks was a nappy. Well that, at least, was something I knew how to use! Together with an absorbent puppy pad, this was placed beneath the filter to collect fuel spills.

Stu and Laura kept a very neat work area, I noticed, always cleaning up after stages, brushing away rust and wiping down parts.

The primary fuel filter was mounted on the starboard side panel of the engine compartment. Stu showed me the CAV 296 primary fuel filter, a 5 micron filter, which is the first line of defence against dirty fuel. This would replace the current filter. Lower down in the engine was the secondary (fine fuel) filter and the oil filter.

There's a glass sediment bowl at the bottom of the primary filter to catch any water or dirt filtered out of the diesel fuel. This appeared to be clean.

Using an 11mm spanner Stu set about removing the filter. I watched, trying my best to film it (see PBO's YouTube channel) as Stu undid the bolt threaded from the top.

How anyone could do that in a rolling sea, I've no idea. I felt seasick just watching him, as the fumes from the spilt



LEFT This is the primary filter unit with filter removed. Don't forget the O-ring!
RIGHT Top tip: use Vaseline to keep seals in place during reassembly



diesel (expertly caught in a milk carton) entered my nose.

Stu removed the top half of the filter while Laura held the glass bowl. The clean state of the fuel filter confirmed Stu's diagnosis that the fuel itself was clean.

"If there's any water in the system it ends up here," said Stu. "You can see there's no water in there, the system is good. In the bottom of these filters there's a little plastic drain, but I hate using it because if this plastic bit breaks you have to dig all the plastic bits out."

Another problem with the three-element primary filter (with the glass bowl) is that the replacement never seems to come with enough seals.

There are seals between the glass base, filter and bottom housing. Using Vaseline to hold the seal in place while the combination was mounted, Stu changed the seal that fits on top, and the one where the filter goes, but had to re-use the existing final one on the glass bowl.

Furthermore, the fixed aluminium housing contained two neoprene seals, one small one that fits on the 'spigot' that the filter pushes onto and one large one that fits in a groove in the housing.

To an observer, these were very difficult to see, but not to be missed, warned Stu. Failure to replace them could result in it leaking air and the engine not starting.

As well as ensuring the seals stay in place during assembly, the three elements themselves have to be in line to get the screw through. What a fiddly job!

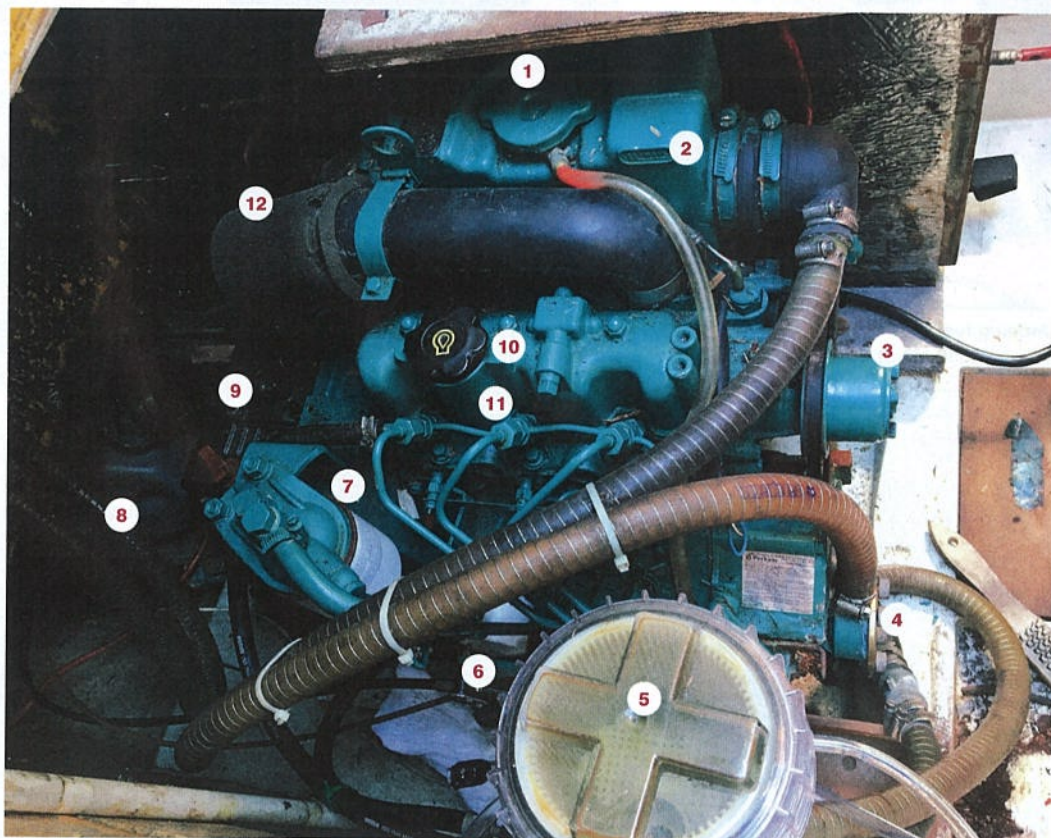
If it's any consolation, Stu admitted it was 'the worst job of all'. Invariably, when the filter gets blocked it's in the middle of a big, heavy sea!

"Imagine trying to do this with a boat going up and down," he said.

Primary filter verdict: A fiddly and messy job. Be sure to have your nappy absorbent pad, and half an empty milk carton, take care with seals and don't forget the Vaseline. Do it in port whenever possible.

KEY

1. Coolant water cap
2. Heat exchanger
3. Alternator drive
4. Raw water impeller
5. Seawater strainer
6. Engine oil filter
7. Secondary fuel filter
8. Seawater pump
9. Engine oil dipstick
10. Oil filler cap
11. Diesel injectors
12. Air intake



3 Secondary fuel filter

We moved on to the secondary filter. This had its own problems, being downright stubborn, and refusing to budge.

With a lot of heaving and grunting Stu managed to free it off with a filter strap wrench – a very useful piece of kit. Again this filter was clean, indicating that the engine had received regular servicing. Stu screwed the new one in by hand until it was just tight.

Secondary fuel filter verdict: Nice and clean, and easier to replace than the primary fuel filter, but don't forget the filter strap wrench.

4 Testing the new filters

Before going any further with the engine service, the fuel system needed bleeding of air and Stu needed to test there were no air leaks in the filters. To do this, Laura used a Pela-type vacuum pump – commonly used for oil changes – to suck fuel through the primary filter to the secondary filter.

This was a quicker option than relying on the engine lift pump.

"If we try to use the lift pump on one of these 2020 engines the capacity is not very good," said Stu.

"It's very difficult to pump a large amount of fuel through because the primary fuel filter holds about half a litre. To pump that amount will take forever."

Stu removed the bleed plug on the secondary filter, made up a fitting for the orifice with some electrical tape and a few

strokes of the pump soon had fuel flowing through the filters. "It's lovely, that!" exclaimed Stu. "Basically the idea is that any dirt hits the primary filter before it gets any further. On my engine I change my primary filter every year and the secondary filter every two years because the first one protects the second."

5 Oil filter change

The oil filter is a spin-on one, mounted horizontally, and again Stu used the filter strap wrench to remove it. The new one was attached and tightened by hand.

"A smear of new oil on the sealing ring is helpful here," advised Stu. "If the filter was mounted vertically I'd fill it with oil first but as it's horizontal it is mounted empty."

The engine takes 2.8lit of oil. The idea is that you put that amount in, start the engine briefly and then check the level. The filter takes up a small amount so the oil level may then need topping up.

Oil filter verdict: You'll need a filter strap wrench to free this, but is otherwise a simple job as long as you have access.

6 Engine oil change

Stu seemed surprised when I asked why we were changing the oil. If the fuel could be re-used after two years' sitting in the tank, why not the oil, I wondered.

"You change the oil as a matter of course," he said, "normally every 100 hours, or a season's use."

He explained that oil can absorb acidic products from the combustion →



Stu uses a strap wrench to free the secondary filter



Clean fuel drawn into the secondary filter using the oil change suction pump. Note bleed plug in Stu's left hand



The secondary filter is removed



The pumped fuel is returned to a container and will go back in the tank

One of the world's most popular engines

The Volvo Penta engine in *Maximus* is a re-badged version of the Perkins 103-06, itself originally imported from a Japanese company called Ishikawajima Shibaura Machinery.

Perkins marketed a marinised version of the engine as the Perama M20. They sold the engine to Volvo Penta who marketed it as their MD2020. Perkins also sold the engine to Massey Ferguson, McCormick, Terramite, Textron, Jacobsen, Cushman, Vermeer, Leech Lewis, JCB, Kobelco, and Northern Lights to name just a few. In the US, the engine was distributed through Detroit Diesel – Allison.

By 1996, Perkins had become so successful at marketing these engines that they formed a joint venture with ISM called Perkins Shibaura Engines and began assembling the engines at the Perkins facility in Peterborough, UK from parts shipped from Japan.

Perkins was eventually acquired by Caterpillar and this little engine has gone on to become one of the most popular engines in the world. It's used in turf equipment, tractors, mini-excavators, brush choppers, compressors, welders, pumps, generators and much more.

Engine spares

The Volvo Penta MD2020 started off as a Perkins engine, so Perkins parts fit and are generally cheaper to source than Volvo spares. Stu Davies recommends people carry a spare oil filter, fuel filters, alternator belt, anodes and a water pump



A spare V-belt to drive the alternator impeller as minimum.

The CAV 296 primary filter is very commonly used all over the world. Stu carries three or four of these, because if you ever get a problem with water in the fuel, this is what you change first. Have a couple of secondary fuel filters available too, and while oil filters tend to only need changing once a year, it's still a good idea to have a spare.

process. The perceived wisdom is to change it before the winter layup but he's left his oil in over winter with no obvious downside. Stu's engine is now 21 years old and after 3,200 hours is still going strong.

Back in the 1990s when this type of engine was developed the specification for the oil was a straight mineral oil, API CD, and these days a good 15/40 mineral oil will do. Semi-synthetic and synthetic oil is not recommended. For this service, we used Hypalube Plus.

Stu showed me the oil filler cap. "When you take it off you see the valve mechanism," he said. "If there's water in the oil you'll see a white emulsion."

Fortunately it was clean, so there was no water or condensation in the engine.

The oil was drained from the starboard side of the engine through a designated pipe using the suction pump.

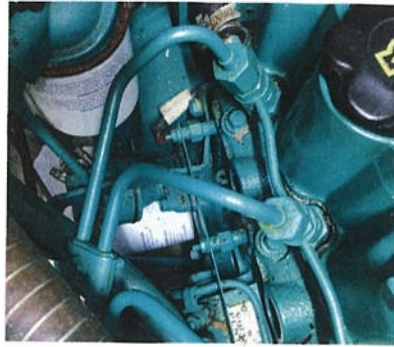
If possible, it's a good idea to warm up the engine first to thin the oil, making the suction easier. However, with *Maximus* on the hard-standing this wasn't an option for us.

On Volvo Penta engines there's a plastic cap on the oil pipe which needs to be pulled off. Stu made a rubber crossover to get the suction pump pipe to fit.

I'm pleased to say the oil came out easily and was relatively clean, again indicating a good servicing regime.

Stu used a cut down oil container as a funnel to refill the engine with new oil. He then checked the level with the dipstick.

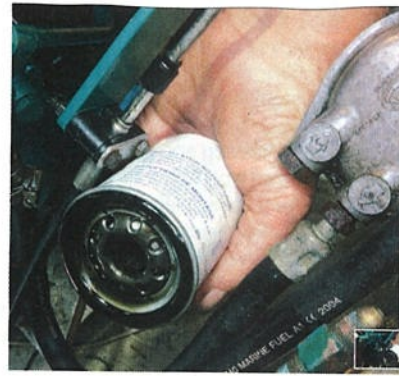
Oil verdict: The oil was clean but replaced as a matter of course.



Oil filler cap (top right) secondary filter (top left) oil filter (bottom)



Oil filler cap removed from the rocker cover, ready for an oil change



Oil filter removed ready for replacement



Checking the oil level on the dipstick

7 Raw water impeller change

Raw water is drawn up to the engine by a pump impeller. Driven by a belt, the impeller rotates inside a chamber

whose circular shape is distorted inwards, creating a partial vacuum to draw water in.

Stu was pleased to see the engine had a Speedseal conversion, allowing easy access to the impeller. This neat, shiny

How an inter-cooled engine works

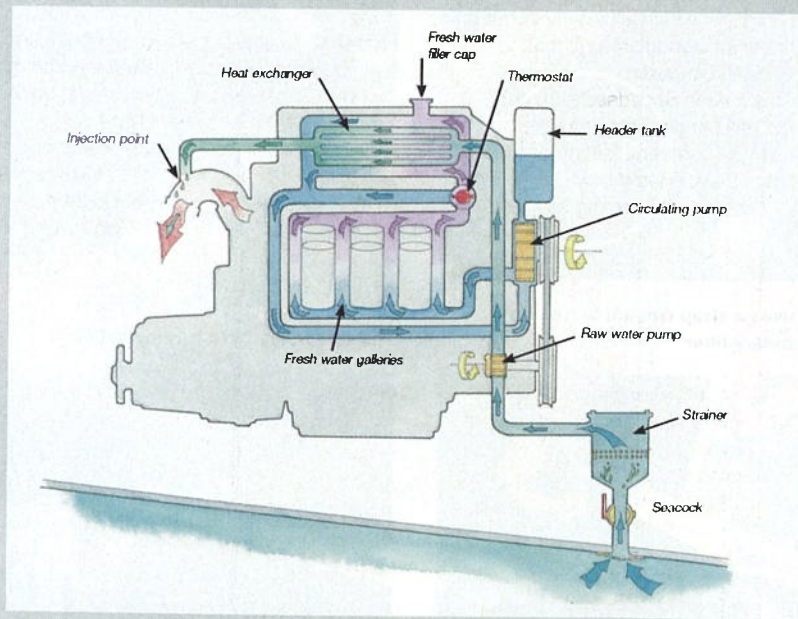
Nowadays the vast majority of engines are 'intercooled' – or cooled by an internal fresh water supply – with the role of the seawater being to take away the heat from the freshwater.

The seawater, or 'raw water', is a separate flow to the fresh water and never comes into contact with the engine. In fact it doesn't come into contact with the fresh water either, but comes very close in the heat exchanger or 'intercooler', which is enclosed in an expansion tank.

The heat exchanger is a stack of thermally conductive tubes immersed in an outer jacket containing freshwater coolant.

The fresh water, which is mixed with antifreeze, is pumped around the engine, taking away the heat from the moving parts. When it reaches the heat exchanger it's cooled down by the constantly replenished seawater, then returns to the engine block to continue with its work.

The now-hot seawater, on the other hand, is pumped into the exhaust system and used to cool the exhaust



gases on its way out. That's why we check for water in the exhaust, and it also explains why you can hear the 'bloop, bloop, woosh' noise of a boat

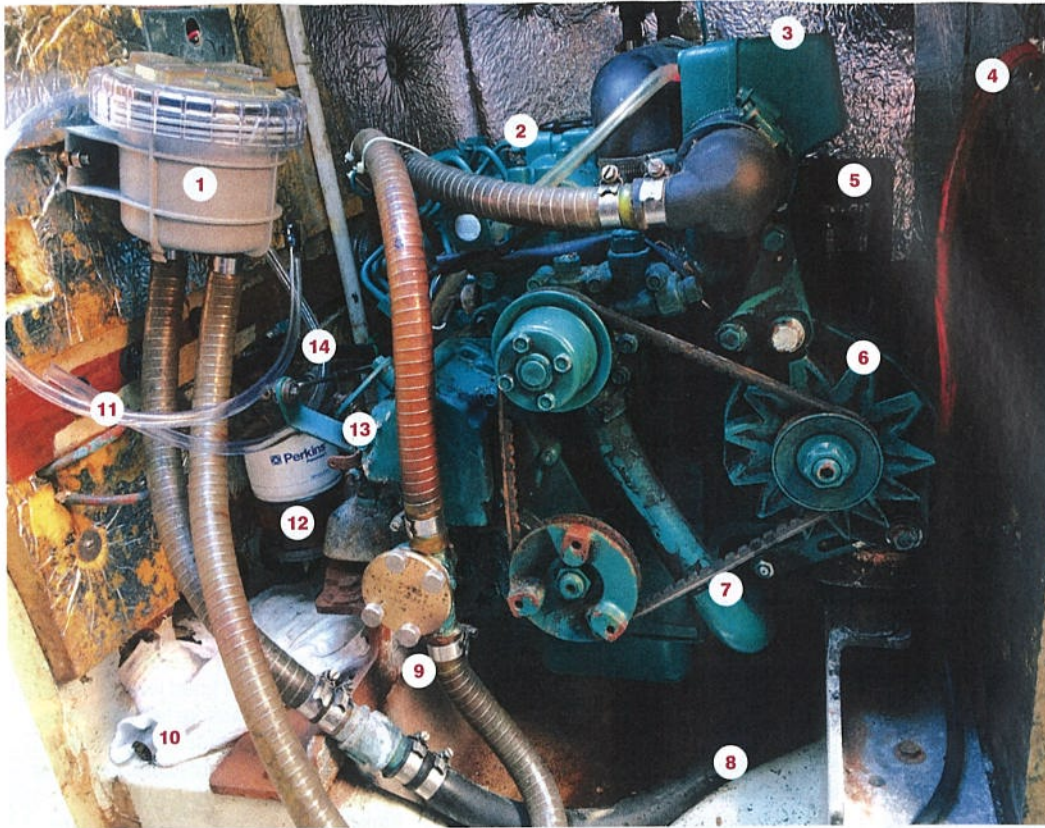
going past; what's happening is that the seawater is building up in the silencer and the pressure of the exhaust is collecting it and blowing it out.

RYA Diesel Engine Handbook



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**KEY**

1. Seawater strainer
2. Oil filler cap
3. Heat exchanger
4. Wiring loom from control panel
5. Relay and fuse box
6. Alternator
7. V-belt
8. Seawater inlet pipe
9. Impeller housing
10. Nappy to collect oil spills
11. Tube from oil removal pump
12. Primary filter
13. Engine throttle
14. Engine stop lever

little piece of kit makes the replacement of the impeller a doddle. With the Speedseal, the six original screws have been replaced with four knurled knobs which can be undone by hand, with the bottom two left in-situ so the impeller cover can simply be slipped upwards. The seal is an O-ring, so it does away with the necessity of a fiddly paper gasket.

Inside there's a Teflon bearing with a bronze washer which allows the pump to be run dry for a short time without damaging the impeller.

For this reason Speedseals are popular with the RNLI and military, Stu explained, but sadly the company that made them has ceased trading and new O-rings and parts for them are becoming scarce.

Tools you'll need

- Strap wrench
- Spanners or wrenches
- Adjustable spanner
- Socket set
- Screwdrivers
- Pliers
- Oil change pump
- Wire brushes (various thicknesses for larger/smaller parts)
- Vaseline for O-rings and greasing screws
- Marine 16 fuel additive
- Oil
- Penknife
- Gloves (it's dirty work)

After the Speedseal cover was taken off Laura removed the impeller with pliers so gently she reminded me of a nurse removing a foreign object from a child's nostril! She gripped each impeller blade alternately so the whole lot gradually worked free.

Stu showed me the cracks and misshapen blades on the old impeller, where it had worn away. That said, it wasn't in too bad a condition with some setting of the blades caused by it being in one position for two years without running. It would still serve as a decent spare, but it was definitely time for a new one.

"The impeller blade picks up a slug of water, and straightens, bends, straightens, bends as the water goes past the lobe," explained Stu. "Over time the lobes wear and it loses its efficiency. A new impeller usually fixes everything, but if it doesn't, occasionally – if you see water coming out of the back of the pump – you have to

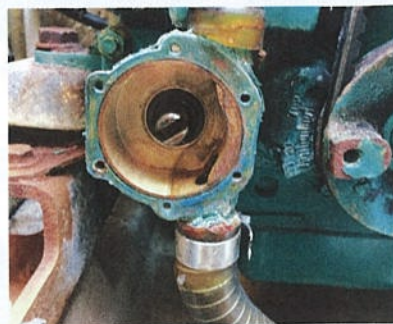
remove the pump and replace the seal."

The seawater pump for this engine is either a Jabsco or a Johnson depending on the year of manufacture. If you give the model number to Parts4Engines they'll send the correct information.

Laura carefully cleaned the bronze housing and cover with a wire brush and slathered everything with the lubricant supplied with the impeller. Again, the O-ring was cleaned and held in place with Vaseline and the impeller put back with the drive pin through the centre, positioned to slide into the drive slot on the shaft in the pump. The blades were carefully bent to one side to enable it to enter the pump.

Stu turned over the engine by hand to make sure the blades were orientated the correct way before replacing the cover.

Impeller verdict: Slightly worn, with misshapen blades, this needed to be replaced, but can be saved as a spare. ➔



The impeller chamber is distorted to facilitate suction with the impeller vanes



Laura cleans the Speedseal impeller cover with a wire brush

8 Check the antifreeze

Stu pointed out where the fresh water coolant is topped up. The cap came off easily and we checked the level, which was about half an inch below – a good sign.

"The antifreeze level looks good and it's green. Normally, when it starts getting exhausted it changes colour. Leave it for now, and then in the winter change the coolant."

The term 'antifreeze' is a misnomer. As well as guarding against frost damage, it contains rust and corrosion inhibitors that help protect the insides of the engine. 'Antifreeze' effectiveness is reduced over time, hence the need for the coolant to be replaced annually, regardless of any risk of freezing.

Verdict: Coolant looks good but will need replacing over winter.

9 Alternator drive belt

The alternator charges the boat's batteries when the engine is running. It's a compact device in which a magnetised rotor spins within a magnetic field, the spinning being done by a V-belt from a pulley on the front of the engine.

The alternator fitted to the MD2020 is usually a 60Ah Valeo alternator, which is more than ample to keep up with the loads of a small boat such as the Maxi 84. It was attached to the engine with a 17mm bolt at the pivot with the adjustment by two 13mm bolts. Stu slackened these and swung the alternator towards the engine so the old belt could be removed.

"Not a lot of people realise this but alternator belts drive on the sides of the 'V', not the bottom," explained Stu. He showed me the worn belt and the replacement. "You can see how wide this

tooth is compared to the old one, which is very badly worn."

The friction to transmit the power to generate electricity is between the sides of the V on the belt and the V of the pulleys. When the belt is worn, it 'bottoms out', meaning there's less surface area to drive the alternator and so the pulleys slip, wear the belt more and it makes things worse.

"Tightening it at this point is useless," concluded Stu. "It needs to be replaced. A sign that things are bad is when you find black dust all around the area of the alternator from the worn belt."

Unfortunately, there was plenty of evidence of this on *Maximus's* engine.

Stu pointed out another complication here being that the rainwater leak had superficially rusted the pulleys.

Laura cleaned the pulleys with a wire brush to remove the surface rust. The new V-belt was fitted and the alternator tensioned using the handle of a hammer as a lever before the bolts were tightened.

"Hear that sound?" asked Stu, twanging the belt with about 1/2in of play at the longest point.

I'd have to remember that sound for some homework later. Stu advised that after an hour's running time it would slacken a bit, so I must re-tension it as the belt beds itself beds in.

Alternator belt verdict: A new V-belt was needed as the old one was badly worn. Don't forget to re-tension after an hour or so of running.

10 Seawater strainer

Most stern and saildrive engines take in raw water through a valve in the leg. This is sucked through a coarse filter, or 'strainer' to prevent waterborn debris getting as far as

the water pump. From the pump the water goes into the antisiphon valve at the back and from there through the filter into the intercooler.

If you get any weed or rubbish, it ends up in the strainer, and that's what we found when Stu took it off.

Raw water strainer verdict: Lift this out occasionally and clean out the weed.

11 Check sail drive oil level

Maximus's engine has a saildrive. Unlike sterndrives, where the engine's mounted at the stern, the saildrive leg can't be steered or tilted. It passes through a strong rubber diaphragm that isolates the engine vibrations from the hull while keeping water at bay.

The saildrive, which has a folding prop, is bolted to the back of the engine and in the Maxi is tricky to reach. Thanks to Laura's slim hands, we managed to access a red oil filler T-screw, which was removed to show a good level of clean mineral oil. We therefore left it as it was.

The oils recommended vary with the engine's year of manufacture. For some Volvo Penta specify ATF (automatic transmission fluid), while for others it's mineral oil. There appeared to be mineral oil in this one.

At the side of this filler cap there was a stack pipe with a knurled knob pushed into it. Stu deduced that this was the access to allow sucking-out of the oil when it needed changing.

Our surveyor, Ben Sutcliffe-Davies, had mentioned that the raw water inlet pipe disappeared under the engine but he couldn't access the valve. We followed the pipe from the raw water strainer and



Stu loosens the alternator bracket adjustment bolts to change the drive belt



New (left) and old alternator belts



Laura removes rust from a pulley wheel with a wire brush

Engine maintenance checks



1 Remove the tank hatch to inspect the fuel tank. Remnants of old diesel bug were evident inside.

2 Check the primary fuel filter for water and change its filter as a matter of routine.



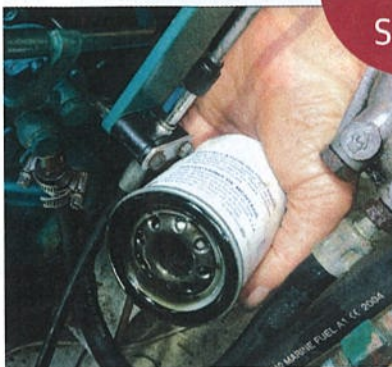
3 Change the secondary fuel filter on the engine.



Step
by
step



4 Bleed the fuel system of air and check the fuel filters for leaks around their seals.



5 Change the engine oil filter once a year when you change the oil.



6 Old oil drained and pouring new mineral oil into the engine.



7 Check and change the raw water pump impeller - this old one is worn but will do as an emergency spare.



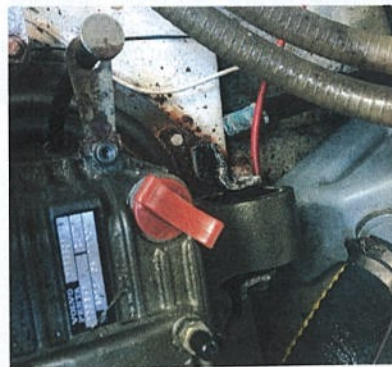
8 Check the level and colour of antifreeze coolant. Drain and renew if necessary.



9 Examine the alternator drive belt and replace it if it shows any signs of wear.



10 Remove the lid and clean out any weed or other debris from the seawater strainer.

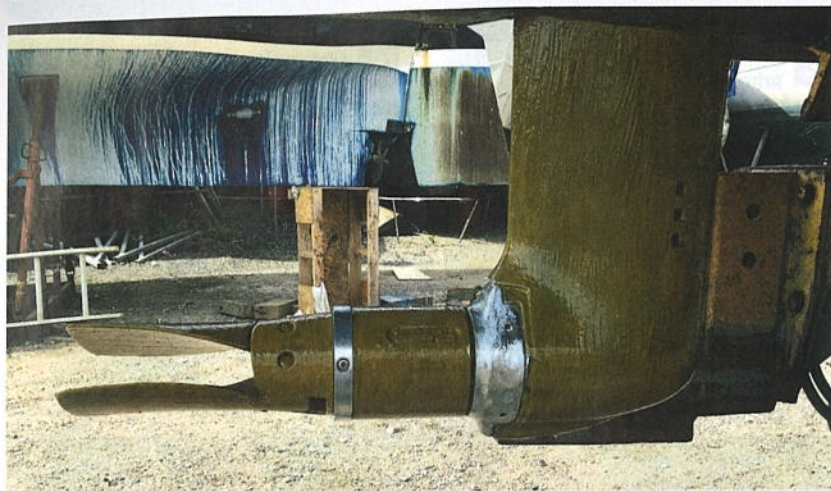


11 Check the saildrive oil level, taking note of the condition of the oil while you're about it.

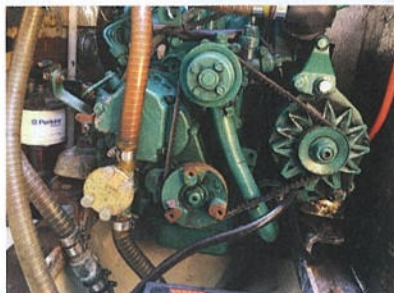


12 Examine and change the saildrive leg anodes if they're showing any signs of being denuded.

The saildrive was painted with Seajet Pellerclean the following week. Here you can see the folding prop, the silver anodes and the holes in the leg where the seawater goes in



Weed in the seawater strainer



Tidied engine looked really smart

found it went to a ball valve which was screwed into the sail drive leg.

Laura cycled it for a while to make sure all was good.

Sail drive oil verdict: The level was good. Mineral oil required for the MD2020.

12 Saildrive anodes

Also during the survey, Ben had noticed the anodes on the outside of the saildrive hadn't been electrically connected to the leg, so we decided to change them. What should have been a simple job turned out to be a mammoth effort involving myself – but mostly Stu and Laura – taking it in turns to drill the seized stainless steel bolt out! We'd certainly earned our tea and biscuits after that.

I didn't have the right prop anode, but ordered a set which my husband fitted the following week.

"One other point," Stu added. "The sail drive is made of aluminium. Don't use copper-based antifouling on aluminium because they react together so you need some special antifouling for that leg."

Just as well that Seajet – who provided our Bioclean antifouling – had also supplied some of their Pellerclean.

Anode verdict: A seized anode can be a monster to get off!

Other things to note

There were a few other things Stu pointed out that were useful to know. The exhaust

pipe was loose and needed strapping down. He also pointed out that the raw water strainer needed some new penny washers to secure it properly.

I was pleased to see there was a mechanical means of stopping the engine if the control panel failed. It seemed fairly easy to access – you just pull it and the engine stops. Similarly, there's a throttle on the engine so you can manually operate it when not in the cockpit.

I asked Stu if he'd ever come across a runaway engine situation. He said he hadn't but occasionally, on engines with electrical solenoids operating the stop lever, the solenoids can fail.

Time to start the engine

Finally the big start! How would the engine perform after two years on the hard standing? We couldn't start the engine in the ordinary way, being on dry land, so Stu poured fresh water directly into the seawater strainer from a 5-gallon drum.

In this instance, we didn't need the seawater intake so we checked the seacock was closed. The engine seacock on *Maximus* is surprisingly hard to find. Since the engine service I must have turned it on and off 20 times, but I still struggle to find it! It involves me leaning right into the engine compartment (making sure loose hair is tied up) and reaching right down the back of it in search of the smooth red, metal lever. It's easier to find when switched off because

Stu and Laura's top engine tips

- Cut the top off a milk carton and wrap it under the fuel filter so you can catch fuel spills
- A nappy helps collect excess oil and diesel. Absorbent pads are great for keeping a clean work area
- Use grease or Vaseline to hold a seal or O-ring in place
- Dip screws in Vaseline before screwing back in to keep them lubricated
- A foam covering for the air intake quietens the engine. You can buy them from car shops.
- Rust often looks worse than it is. It's surprising what a wire brush can do
- A torch is handy for looking into the dark recesses of an engine. A head torch is good as it leaves your hands free
- Every yacht should have a Swiss Army knife – perfect for many jobs
- Write the installation date on the filters to remind you when they need changing
- Wonder Wipes help keep a workstation clean



A wire brush is essential kit

it's at right angles to the inlet pipe.

Understanding where the seacocks are is essential for all the crew, and this reminded me to allow extra time in future when on other people's boats to find the engine seacock. Hopefully it won't be as difficult to reach as this one!

The electrician had left a nicely charged 80Ah battery for us which Stu connected. Laura turned the key on the start panel and it all lit up OK. She waited until the heating or glow plugs lit up for 30 secs and then turned the key all the way.

The engine started first time! What a pleasing noise. I checked the back of the boat and saw the water running out of the exhaust. The cooling water was pumping OK, and with the charge light out, we ran it for a minute or two until the drum of water ran out.

It was the outcome we'd all hoped for. Finally, *Maximus* was ready to launch!

- For a thorough understanding of how the diesel engine works and how to maintain it, get the RYA's *Diesel Engine Handbook* by Andrew Simpson